SOUTH DAKOTA STATEWIDE FISHERIES SURVEY

2102-F21-R-46

Name: Curlew Lake **County**: Meade

Legal description: Sec 2,10,11, T 3N, R 11E
Location from nearest town: 8 mi. N, 4 mi. E, 1.5 mi. N of New Underwood, SD
Dates of present survey: June 10-12, July 29, 2013
Date last surveyed: July 2-4, August 17, September 18, 2012
Management classification: Warm water permanent

Primary Species: (game and forage)	Secondary and other species:
1. Black Crappie	1. Bluegill
2. Largemouth Bass	2. Yellow Perch
3. Walleye	3. Black Bullhead
4. Gizzard Shad	4. Northern Pike
5.	5. Channel Catfish
6.	6. Common Carp
7.	7. White Sucker

PHYSICAL CHARACTERISTICS

Surface Area: 136 acres **Watershed:** 12,800 acres
Maximum depth: 22 feet **Mean depth:** 10.2 feet
Lake elevation at survey (from known benchmark): -4 feet

Ownership of lake and adjacent lakeshore property:

Curlew Lake is owned and managed by the South Dakota Department of Game, Fish and Parks. All land bordering the immediate shoreline, excluding three quarter sections in Section 2 and a small tract of land comprising 10 acres in Section 11, are owned by the Department of Game, Fish and Parks. The 10-acre tract in Section 11 has a written access agreement with the landowner; the three quarter sections in Section 2 do not have active access agreements. There is no record of problems regarding public access across this section of land.

Fishing Access:

Fishing access at Curlew Lake is good for boat and shore anglers alike. Curlew Lake has a well maintained gravel road leading to a relatively new boat ramp with a dock. Shore access is good with trails around much of the lake including the dam face. When conditions are wet, however, trails around the lake are soft and slippery. Typically, emergent and submerged vegetation is sparse around the lake offering shore anglers ample opportunity.

Observations of Water Quality and Aquatic Vegetative:

Rooted aquatic vegetation appears along most of the shoreline, but is not real heavy. Bulrush is the primary emergent plant species associated with the lake. Coontail and Sago pondweed are the most abundant submersed vegetative species in the lake. Siltation at inlets and shorelines

due to natural erosion around the reservoir and cattle grazing on the private tract and its shoreline has decreased depth and area within the lake. No other pollution problems were identified by department personnel during the 2013 survey.

Observations on condition of structures (i.e. spillway, boat ramps and docks, roads, etc)

All access and regulatory structures appear to be in adequate condition. A new boat ramp was installed in 2005. Also, in 2009 a boat dock was reconditioned by the Rapid City Area Chapter of Walleyes Unlimited and installed with an MOU between them and the SD GF&P.

MANAGEMENT OBJECTIVES

Objective 1. To maintain a Walleye fishery with a minimum gill-net CPUE for stock-length Walleye of 10 and a PSD range of 30-60.

Objective 2. To maintain a Largemouth Bass fishery with a minimum nighttime electrofishing CPUE for stock-length fish of 20, PSD range between 40 and 70, and growth rates at or near the statewide average.

Objective 3. Maintain a Black Crappie population with a trap net CPUE of at least 20 and PSD of greater than 40.

Objective 4. Experimentally stock 50 – 100 adult Gizzard Shad in 2012 and 2013 to improve the forage density.

BIOLOGICAL DATA

Sampling Effort and Catch

Age-0 Fish Survey

Daytime boat electrofishing was used on July 29th to index Gizzard Shad reproduction. Electrofishing was done using a boat mounted Smith-Root unit with pulsed-DC. Sampling consisted of five stations totaling 25 minutes of electrofishing. Day electrofishing is summarized in Table 1.

Adult Fish Survey

Trap and gill nets were used on July 10-12, 2013 to index adult fish populations in the reservoir (Figure 1). The net sampling consisted of eight trap net nights and two gill net nights and catch data is displayed in Tables 2 and 3. Discussion on selected fish species follows and completes this report.

Table 1. Site number, number collected per site (No./Site), pedal time, and estimated number per hour of Gizzard Shad sampled using daytime electrofishing from Curlew Lake, Meade County, South Dakota, July 29, 2013

Site	No./Site	Time (sec)	No./hr
1	5	300	60
2	105	300	1,260
3	54	300	648
4	157	300	1,884
5	52	300	624
Total	373	0.42hr	895.2

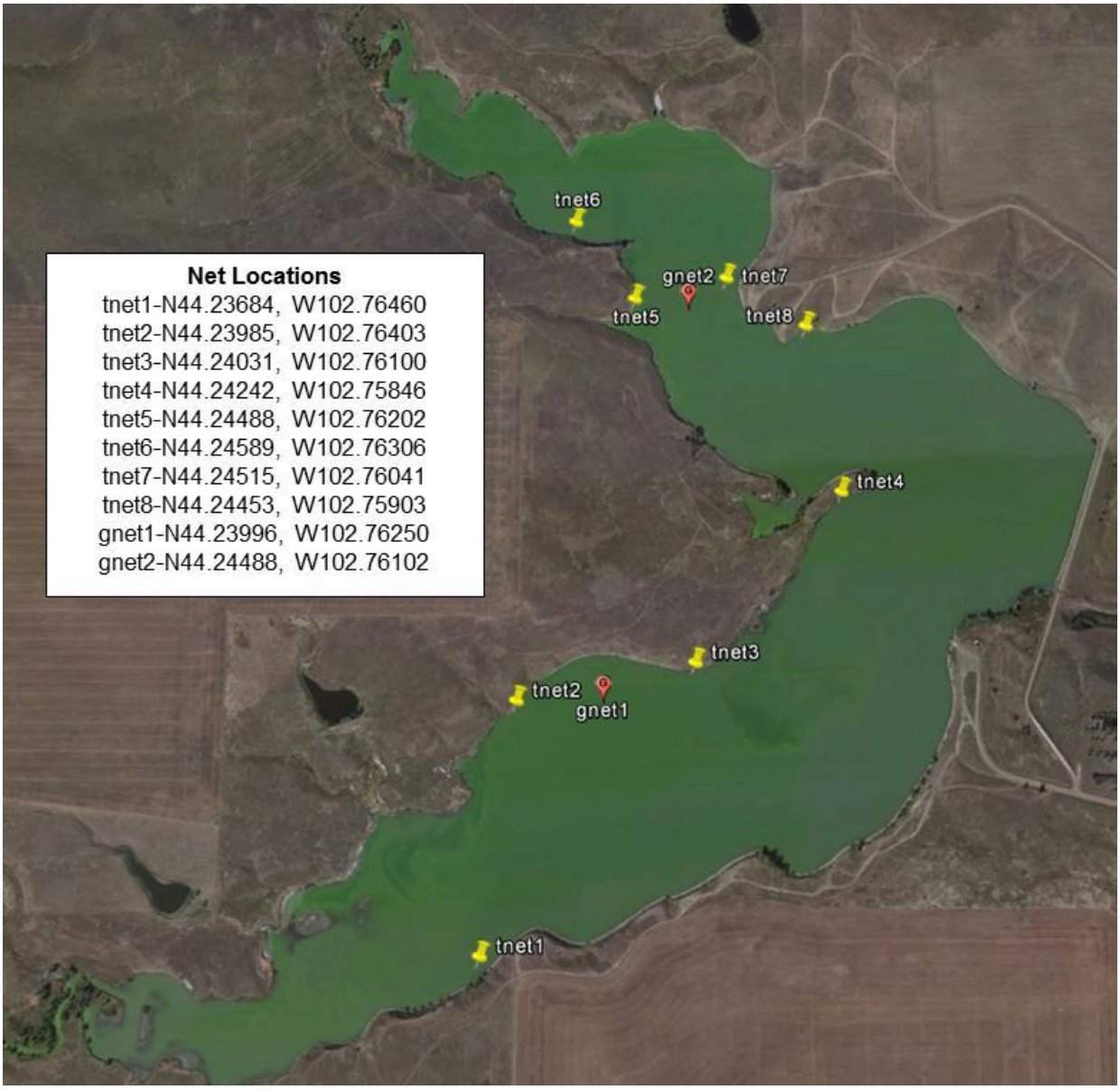

Figure 1. Locations of experimental gill (gnet) and modified fyke (tnet) nets during the annual fisheries survey in Curlew Lake, Meade County, South Dakota, 2013.

Table 2. Catch data from all species collected in eight trap nets in Curlew Lake, Meade County, June 10-12, 2013. CPUE's with 80% confidence intervals in parentheses. PSD, PSD-P and Wr with 90% confidence intervals in parentheses.

Species	N	CPUE	CPUE-S	PSD	PSD-P	Wr ≥ S
Black Bullhead	550	68.8 (18.6)	65.9 (17.7)	1(1)	0	82.8 (1.5)
Black Crappie	704	88.0 (22.4)	87.5 (22.3)	59 (6)	8 (3)	102.5 (0.9)
Bluegill	4	0.5 (0.4)	0.5 (0.4)	25 (59)	0	105.1 (9.3)
Common Carp	1	0.1 (0.2)	0.1 (0.2)	--	--	91.9 (--)
Golden Shiner	2	0.3 (0.4)	--			--
Walleye	1	0.1 (0.2)	0.1 (0.2)	--	--	88.3 (--)
Yellow Perch	24	3.0 (1.8)	3.0 (1.8)	67 (17)	0	80.1 (1.7)

Table 3. Catch data from all species collected in two gill nets in Curlew Lake, Meade County, June 10-12, 2013. CPUE's with 80% confidence intervals in parentheses. PSD, PSD-P and Wr with 90% confidence intervals in parentheses.

Species	N	CPUE	CPUE-S	PSD	PSD-P	Wr ≥ S
Black Bullhead	25	12.5 (7.7)	12.5 (7.7)	0	0	80.3 (0.5)
Black Crappie	23	11.5 (20.0)	11.5 (20.0)	0	0	98.9 (1.8)
Channel Catfish	3	1.5 (1.5)	1.5 (1.5)	--	--	103.6 (18.8)
Common Carp	1	0.5 (1.5)	0.5 (1.5)	--	--	85.3 (--)
Gizzard Shad	7	3.5 (1.5)	0.0 (--)	0	0	--
Golden Shiner	1	0.5 (1.5)	0.5 (1.5)			
Northern Pike	7	3.5 (1.5)	3.5 (1.5)	100	14 (28)	100.6 (1.4)
Walleye	55	27.5 (10.8)	27.5 (10.8)	58 (11)	0	95.8 (1.0)
Yellow Perch	9	4.5 (13.8)	4.5 (13.8)	11 (21)	0	82.6 (2.8)

Black Bullhead

Black Bullhead abundance was similar to last year. Trap net CPUE was 68.8, compared to 59.8 last year (Tables 2 and 4). Stock density values indicate a population dominated by small fish with a PSD value of only 1 and PSD-P at 0. Last year, PSD was 3 and PSD-P was 0. Mean condition (Wr) for stock length and larger Black Bullheads was low at 82.8. Although no age data was collected, length frequencies suggest a strong year class or two under quality length (Figure 2).

Table 4. Composite listing of data for Black Bullhead collected by trap nets in Curlew Lake, 2006-2013. CPUE's with 80% confidence intervals in parentheses. PSD, PSD-P and Wr with 90% confidence intervals in parentheses.

Year	N	CPUE	CPUE-S	PSD	PSD-P	Wr≥S
2006	4	0.6 (0.6)	0.6 (0.6)	100	50 (50)	103.6 (5.0)
2007	1	0.1 (0.2)	0.1 (0.2)	0	0	77.6 (--)
2008	25	3.1 (1.2)	2.9 (1.3)	13 (12)	0	105.6 (3.6)
2009	105	17.5 (11.0)	13.5 (10.3)	9 (6)	0	82.8 (9.4)
2010	532	88.7 (62.8)	37.2 (27.0)	5 (3)	0	75.4 (2.2)
2011	1500	187.5 (46.9)	185.5 (46.4)	4 (1)	0	93.6 (2.2)
2012	478	59.8 (21.3)	59.8 (21.3)	3 (1)	0	86.2 (1.7)
2013	550	68.8 (18.6)	65.9 (17.7)	1 (1)	0	82.8 (1.5)

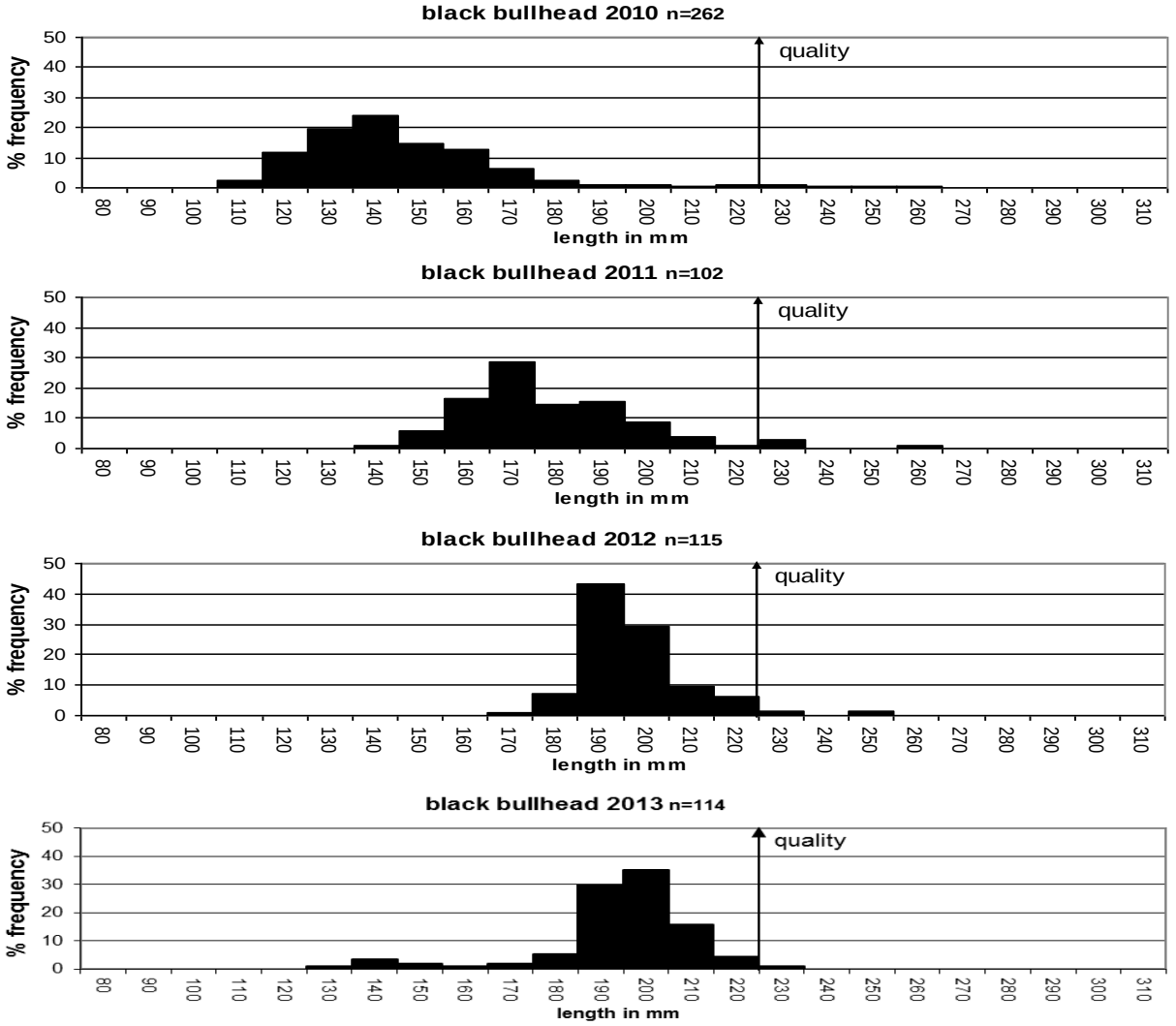

Figure 2. Length frequencies of Black Bullheads from trap nets in Curlew Lake, 2010-2013.

Black Crappie

Black Crappie abundance was also similar to last year. Trap net CPUE was 88.0, compared to 107.3 last year (Tables 2 and 6). Size structure increased from last year with a PSD of 59 this year and 43 last year. Also in the 2012 survey, no Black Crappies were sampled over the preferred-length of 250 mm (10 in; Figure 3). This year eight percent of the fish over stock length were over 10 inches. Fish condition was good with a Wr for stock-length and larger fish of 102.5. Growth was higher than the regional average (Table 6). These numbers are encouraging considering the density of Black Crappie in Curlew Lake. The additional forage provided by Gizzard Shad may be helping growth and size structure, as PSD and PSD-P of the Black Crappie population in this lake were both at their greatest in at least seven years.

Table 5. Composite listing of data for Black Crappie collected by trap nets in Curlew Lake, 2006-2013. CPUE's with 80% confidence intervals in parentheses. PSD, PSD-P and Wr with 90% confidence intervals in parentheses.

Year	CPUE	CPUE-S	PSD	PSD-P	Wr≥S
2006	178.3 (97.8)	12.3 (9.2)	91 (6)	0	84.5 (0.2)
2007	353.1 (111.7)	216.4 (68.7)	17 (2)	0	100.7 (1.3)
2008	54.6 (15.9)	48.9 (14.3)	9 (3)	2 (1)	107.4 (1.1)
2009	18.0 (10.1)	16.3 (9.0)	38 (8)	2 (2)	101.5 (0.7)
2010	19.8 (10.7)	19.7 (10.6)	34 (7)	2 (2)	93.3 (1.0)
2011	57.5 (25.7)	57.5 (25.7)	31 (4)	2 (1)	101.8 (0.7)
2012	107.3 (25.7)	61.1 (14.6)	43 (4)	0	102.5 (2.4)
2013	88.0 (22.4)	87.5 (22.3)	59 (6)	8 (3)	102.5 (0.9)

Table 6**.** Curlew Lake Black Crappie year class, age in 2013, sample size (N), mean back-calculated total length-at-age, the Region 1 mean length-at-age, and the South Dakota state-wide Black Crappie mean length-at-age (Willis et al 2001). Standard errors are in parentheses.

Year Class	Age	N	1	2	3	4	5
2011	2	286	99	146			
2010	3	166	93	165	221		
2009	4	166	103	166	196	239	
2008	5	82	88	149	183	207	248
2013 Pop. mean (SE)		700	96 (3)	157 (5)	200 (11)	223 (16)	248 (0)
2012 Pop mean (SE)		820	85 (4)	148 (6)	178 (8)	199 (2)	208 (0)
Region 1			74 (3)	122 (7)	158 (9)	197 (13)	217 (16)
South Dakota			83 (2)	147 (4)	195 (5)	229 (6)	249 (6)

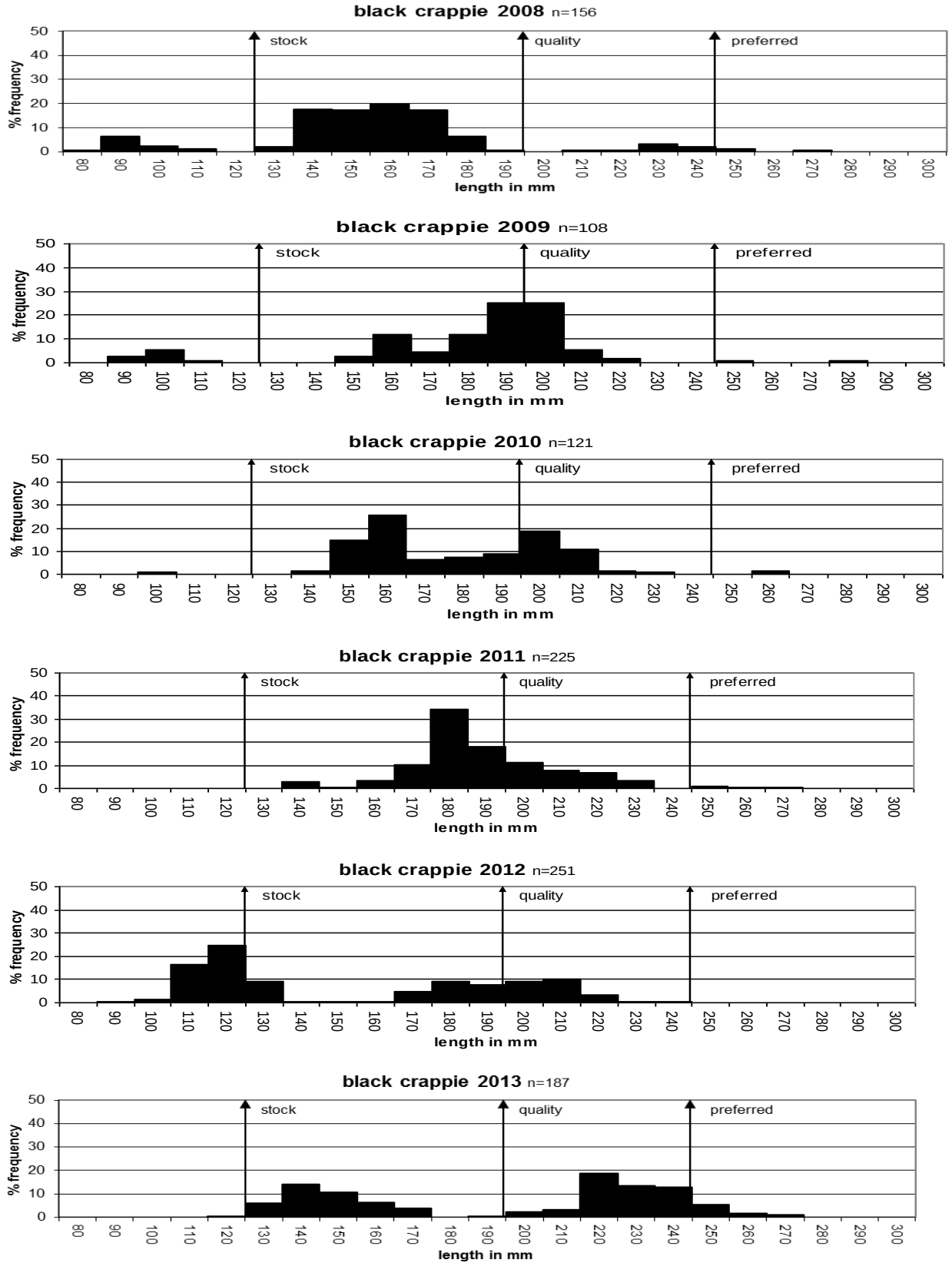

Figure 3. Length frequencies of Black Crappie from trap nets at Curlew Lake from 2008-2013.

Walleye

To increase Walleye abundance at Curlew Lake, a 14-inch minimum-length-limit for Walleye was put in effect January 1, 2004. In 2010, that regulation changed to a 15-inch minimum and the daily limit was also dropped from a daily limit of four walleye in possession to two. Since the summer of 2008, small Walleye fingerlings have been stocked to increase Walleye density and also add predatory pressure on the Black Bullhead and Black Crappie populations. In 2010, two gill nets caught a total of three Walleye for a CPUE of 1.5 (Table 7). Last year, the gill nets had a CPUE of 4.5. Otoliths aged from Walleye in the gill net sample showed slow growth with four year old Walleye averaging 326 mm (Table 8). Fish condition was poor with an average Wr for stock length and larger Walleye of 80.8.

In May of 2012, a stocking of adult Gizzard Shad was made to help increase growth and condition of Walleyes by providing additional forage. This year Walleye abundance was up with a gill net CPUE of 27.5 (Table 7). Fish condition was excellent with a Wr of 95.8. Growth was also excellent with those four year old Walleye from last year that averaged 326 mm now at five years old averaging 410 mm (Table 9), showing 80+ mm (3.3 inches) of growth in just over eleven months, and now over quality length and available to angler harvest (Figure 4). Walleye numbers are now with in the management objectives set for Curlew.

Table 7**.** Composite listing of data for Walleye collected by gill nets in Curlew Lake, 2008-2013. CPUE's with 80% confidence intervals in parentheses. Wr≥S with 90% confidence interval in parentheses.

Year	N	CPUE	CPUE-S	Wr≥S
2008	1	0.5 (0.3)	0.5 (0.3)	
2009	11	5.5 (13.9)	0.0 (--)	--
2010	3	1.5 (4.6)	0.0 (--)	--
2012	9	4.5 (1.5)	4.5 (1.5)	80.8 (4.0)
2013	55	27.5 (10.8)	27.5 (10.8)	95.8 (1.0)

Table 8**.** Curlew Walleye length range and weighted mean length (mm) at capture by otolith ages from gill net sample July 4-6, 2012.

Age	Minimum length range @ capture	Weighted mean length @ capture	Maximum length range @ capture	Number of fish in survey
4	254	326	395	8
7	690	690	690	1

Table 9. Curlew Walleye length range and weighted mean length (mm) at capture by otolith ages from gill net sample June 10-12, 2013.

Age	Minimum length range @ capture	Weighted mean length @ capture	Maximum length range @ capture	Number of fish in survey
2	280	299	332	12
3	312	350	372	4
4	363	373	386	4
5	352	410	493	53

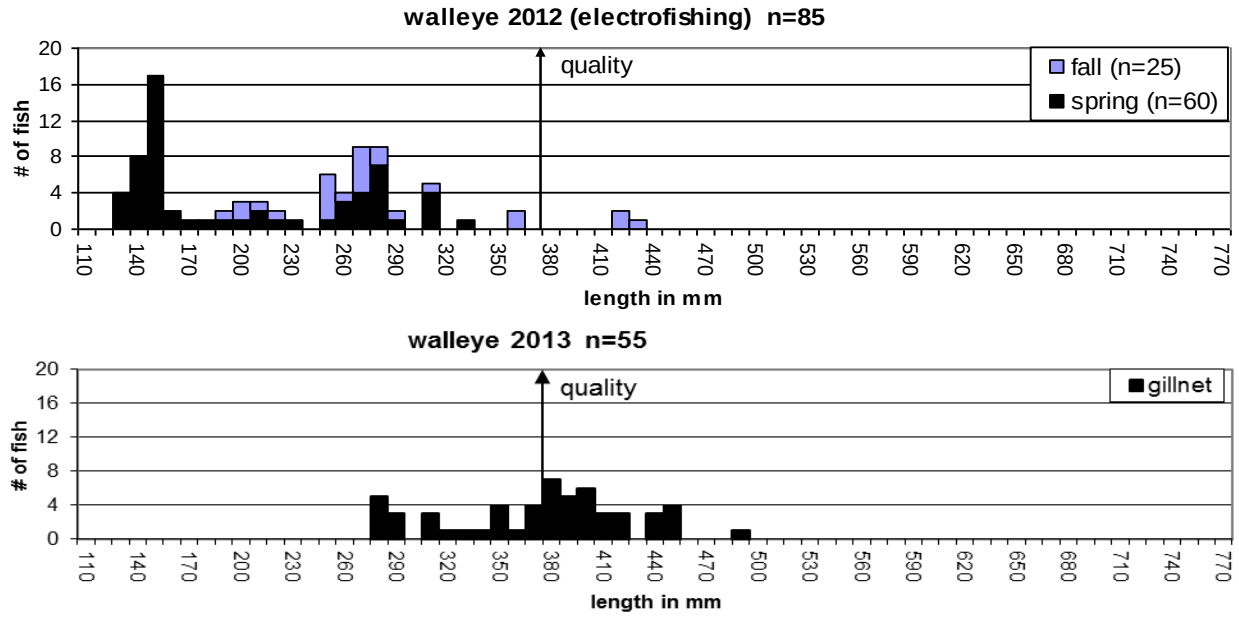

Figure 4. Lengths of Walleye sampled from Curlew Lake, Meade County, 2012-2013.

RECOMMENDATIONS

1. Stock Walleye fingerlings biennially at a rate of 100 per acre to increase Walleye density.

2. Stock 50 to 100 adult Gizzard Shad into Curlew Lake in Spring of 2014.

3. Survey fish populations annually while Gizzard Shad stockings are being accomplished to document changes in fish populations (i.e. size structure, densities, growth, condition) that may be associated with Gizzard Shad as a new forage source.

LITERATURE CITED

Willis, D.W., D.A. Isermann, M.J. Hubers, B.A. Johnson, W.H. Miller, T.R. St. Sauver, J.S. Sorenson, E.G. Unkenholz, and G.A. Wickstrom. 2001. Growth of South Dakota Fishes: A Statewide Summary with means by region and Water Type. Special Report. South Dakota Department of Game, Fish and Parks. Pierre, South Dakota.

APPENDIX

Appendix A. Stockings in Curlew Lake, Meade County, 2008-2013.

Year	Number	Species	Size
2008	46,990	Walleye	Fingerling
	13,000	Largemouth Bass	Fingerling
2009	70	Channel Catfish	Adult
	400	Yellow Perch	Adult
	150	Largemouth Bass	Adult
	23,960	Largemouth Bass	Fingerling
	46,260	Walleye	Fingerling
2010	250	Golden shiner	Adult
	14,000	Walleye	Fingerling
	8,420	Largemouth Bass	Fingerling
2011	200	Channel Catfish	Adult
	1,398	Yellow Perch	Adult
2012	54	Gizzard Shad	Adult
	13,320	Largemouth Bass	Fingerling
2013	35	Gizzard Shad	Adult
	4,000	Walleye	Large fingerlings